

PSP Bloom of Late Fall 1997

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The DOH Program

The Office of Shellfish Programs, in the Washington State Department of Health has a Marine Biotoxin Monitoring Program that monitors for paralytic shellfish poisoning (PSP) and amnesic shellfish poisoning (ASP) (or domoic acid poisoning [DAP]). PSP represents a significant threat to public health. The symptoms of PSP, which can begin within 30 minutes, are:

- Tingling of the lips and tongue;
- Numbness of the arms, legs, and neck;
- General muscular incoordination;
- Dizziness, weakness, drowsiness, and incoherence;
- Headache, rapid pulse, and respiratory distress;
- Vomiting, diarrhea, and abdominal pain;
- Muscular paralysis; and
- Death.

South Puget Sound PSP Bloom

Case Inlet

In the late fall of 1997, a significant PSP bloom occurred in south Puget Sound. The bloom, which began in northern Case Inlet, was first detected in a blue mussel (*Mytilus edulis*) sample, collected on October 21, 1997, from the Port dock at the town of Allyn, (<38 µg of toxin per 100 g of shellfish tissue). On November 4, 1997, the toxin level had increased to 92 µg/100g and Case Inlet south to Stretch Island was closed for commercial and recreational shellfish harvesting. Case Inlet had experienced several blooms in recent years prior to 1997, with the highest toxin levels approaching 800 µg/100g in early December 1991. By December 1, 1997, the toxin level at Allyn had risen to 6799 µg/100g, closing the rest of Case Inlet. This was the highest level recorded in Washington since the record Whidbey Island bloom of 1978, where toxin levels reached 30,000 µg/100g.

Other Areas in the South Sound

By December 1st 1997, PSP had extended into other, previously unaffected areas of South Puget Sound, requiring additional sport shellfish harvesting closures for all the waters around Harstine and Squaxin Islands in Mason County, and all the waters in Thurston County. Additionally, all the Pierce County waters south of the Narrows Bridge were closed.

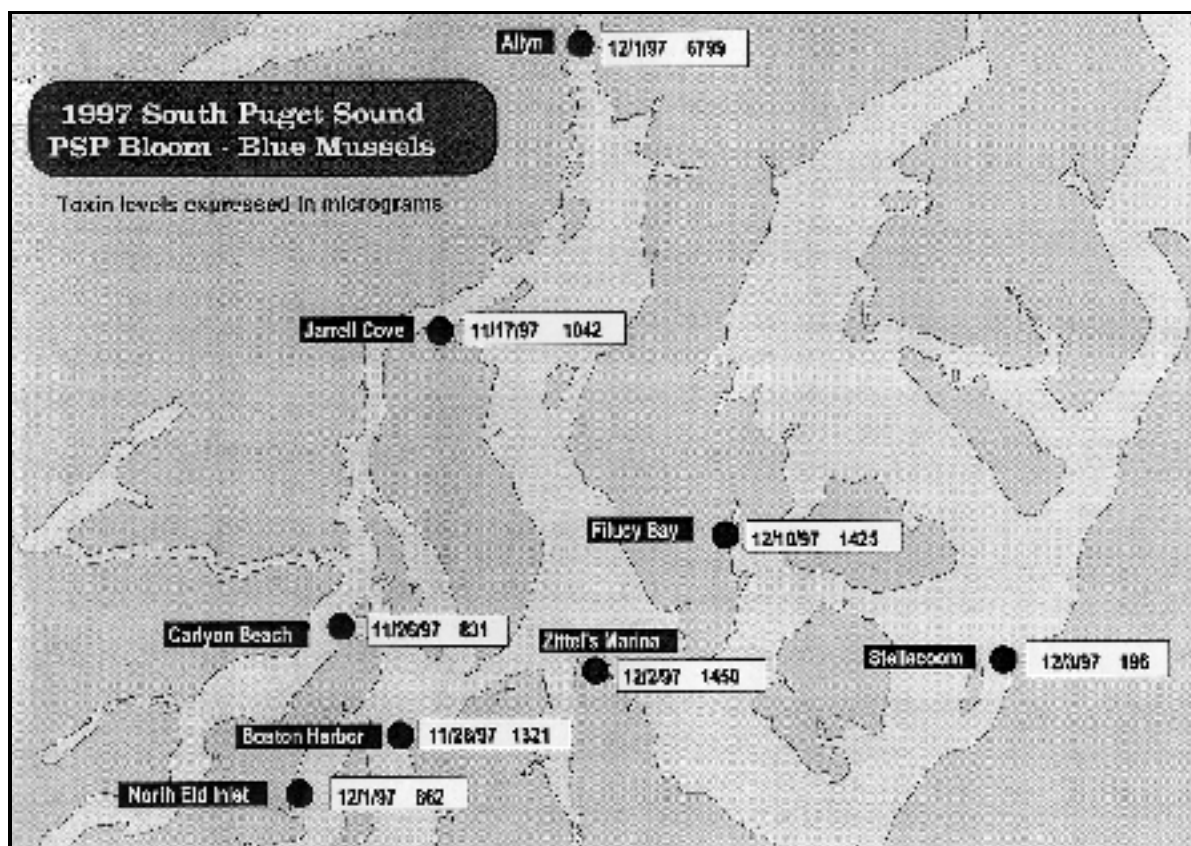


Figure 1. PSP in south Puget Sound blue mussels.

South Puget Sound Commercial Closures

Commercial closures included Case Inlet, Filucy Bay, Burley Lagoon, Pickering and Peale Passages and North Eld Inlet. There were 36 commercial companies with tidelands in the closed areas that were impacted and 11 more in South Eld Inlet that were impacted to a lesser degree. Other areas such as Totten Inlet, Hammersley Inlet, and Oakland Bay had detectable levels of toxin, but were not closed. In response to the detected toxin, many commercial companies in the open areas adjacent to the toxic areas were required to submit a large number of samples of shellfish during the bloom. The species of shellfish under commercial cultivation that were impacted included blue mussels, manila and native Littleneck clams, Pacific and European flat oysters, and geoduck clams.

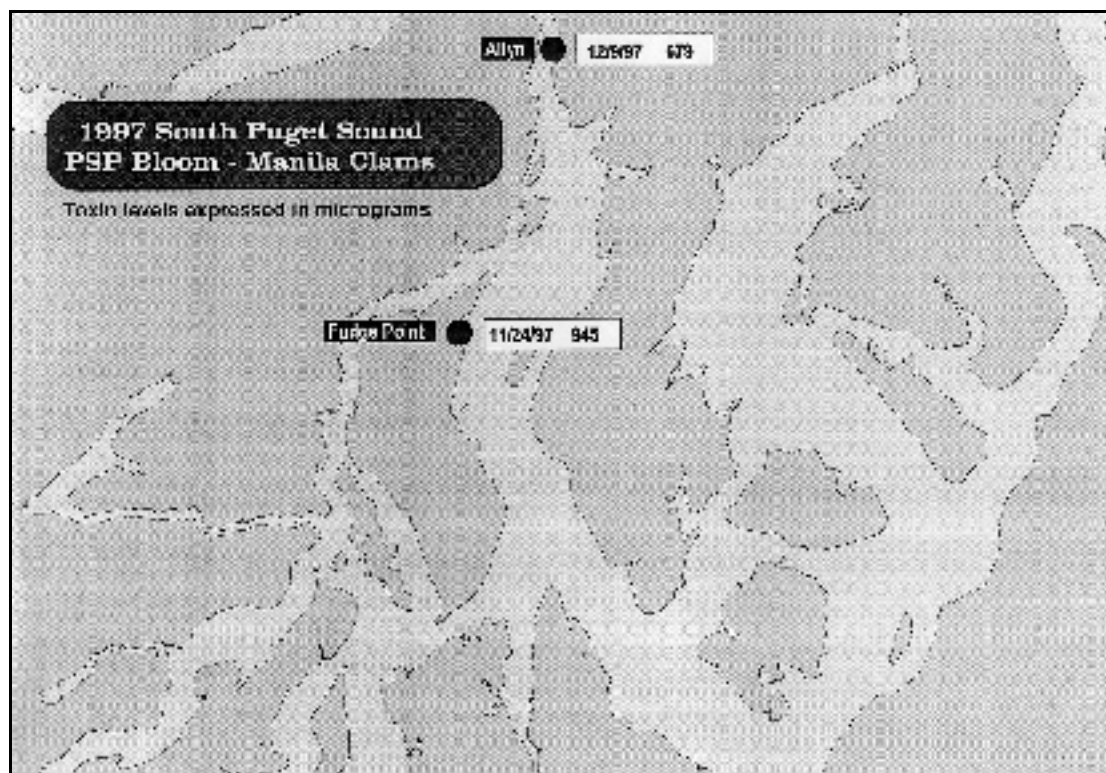


Figure 2. 1997 south Puget Sound PSP bloom in manila clams.

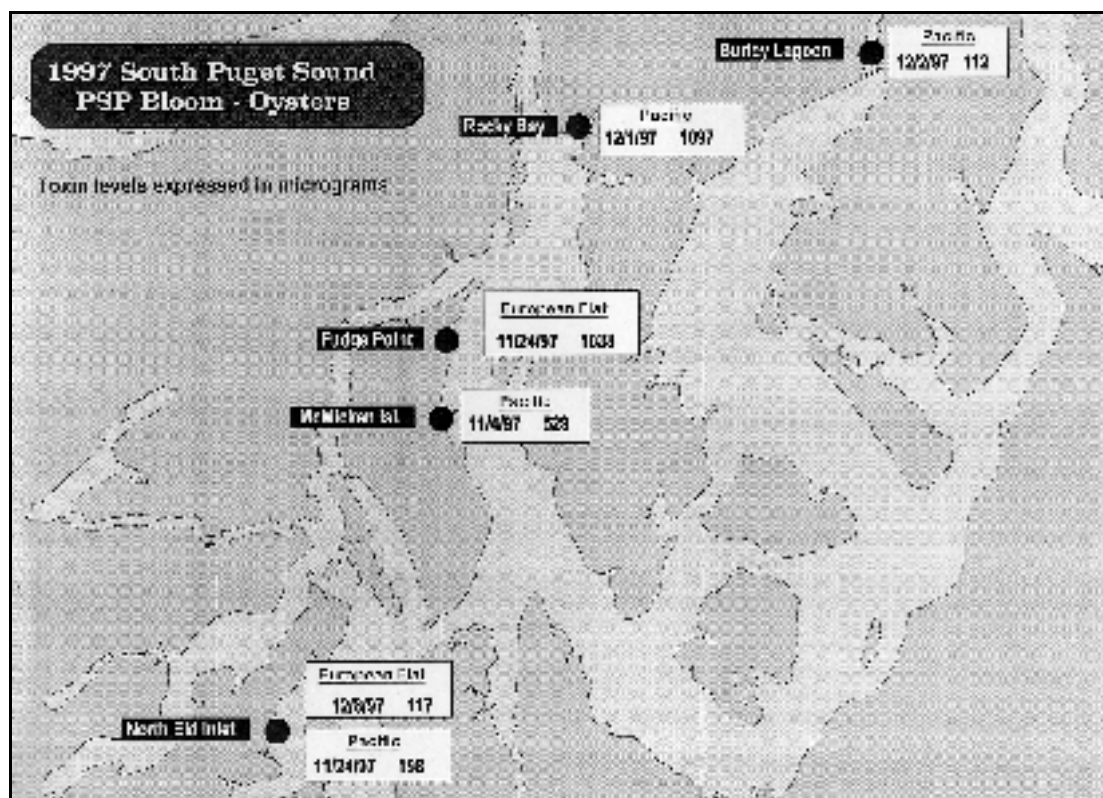


Figure 3. 1997 south Puget Sound PSP bloom in oysters.

Recalls and Illness

There was only one shipment of shellfish that had to be recalled during this bloom event. That shipment was still in transit at the time of the recall, so the toxic shellfish never reached the market. No other toxic shellfish reached the market. There were no reported illnesses associated with the 1997 fall PSP bloom.

Unusual PSP Bloom

There were three unusual aspects of this bloom: first, the late time of year of the occurrence; second, the areas involved; and third, the high level of toxin recorded. All together, there were seven sample locations in south Puget Sound that exceeded 1,000 µg/100g of PSP toxin.

Causes and Other Blooms

The unusually mild, September-like, calm, sunny weather may have played an important part in the timing of this bloom. Other locations in north Puget Sound, such as Sequim Bay in Clallam County, Discovery Bay in Jefferson County, and Birch Bay in Whatcom County, also experienced blooms at about the same time as the south Sound bloom. However, unlike south Puget Sound, these blooms did not reach very high levels of toxin and were brief in duration. The late timing of these other blooms was also most unusual.

Coastal Blooms

There were two other areas that experienced PSP blooms in November of 1997, Grays Harbor and Willapa Bay. Even though they are not part of Puget Sound, the coastal blooms are noteworthy. They were very significant and had a larger overall economic impact to the shellfish industry of Washington. The timing of all of the late fall blooms was unfortunate as they occurred right before Thanksgiving, which is the busiest time of the year for the oyster industry.

Grays Harbor Bloom

The bloom in Grays Harbor was first detected in California or sea mussels (*Mytilus californianus*) on October 29, 1997, which had a toxin level of <38 µg/100g. By November 12, 1997, the toxin had risen to 86 µg/100g. Consequently, the seven commercial companies operating in the harbor were switched to a lot-testing plan and the harbor was closed for recreational shellfishing. If a commercial bed tested at levels of 80 µg/100g or higher, it was closed. To reopen, a bed needed two samples below 80 µg/100g, collected between seven and 10 days apart. The bloom peaked around November 20, 1997, when the highest toxin level (286 µg/100g), which was in Pacific oysters (*Crassostrea gigas*) from Elk River, was recorded. By December 2, 1997, all the commercial shellfish beds were reopened. The rain storm in mid-November may have flushed the bloom out of the harbor.

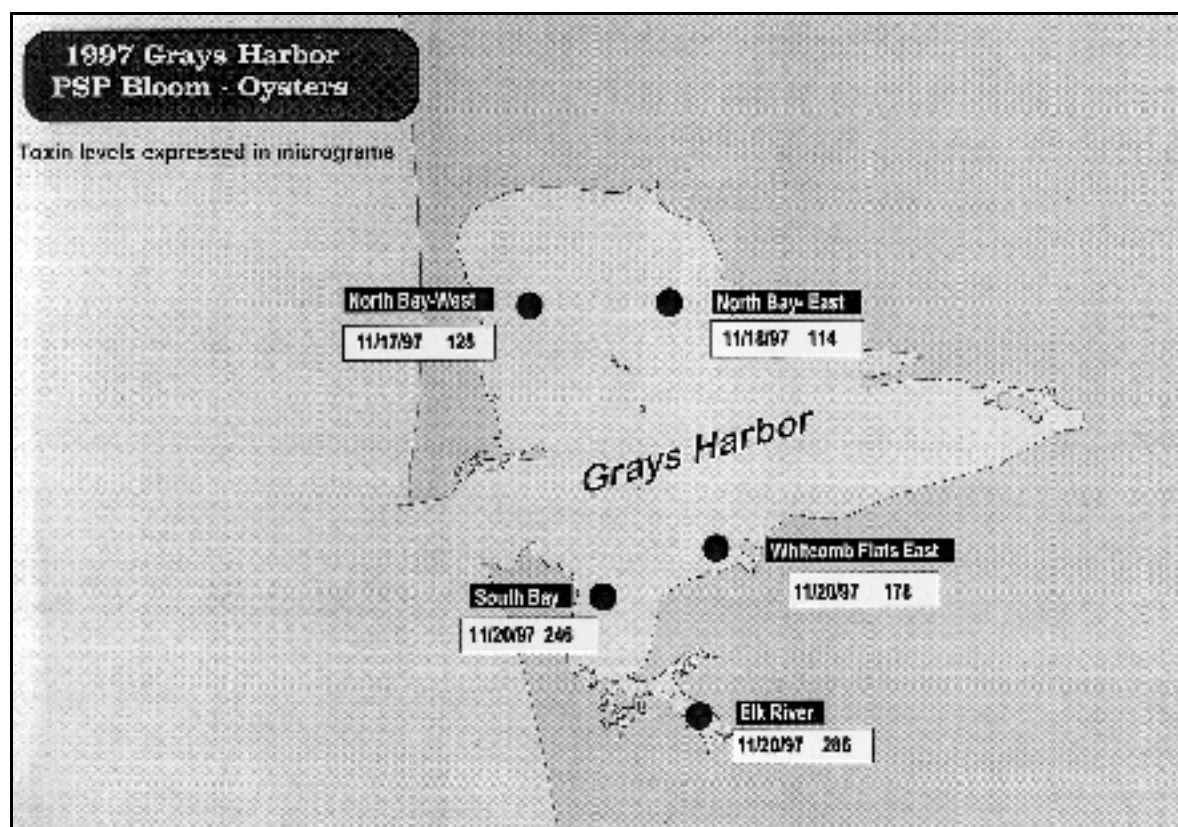


Figure 4. PSP in Grays Harbor.

Willapa Bay Bloom

The Willapa Bay bloom was first detected in California mussels and Pacific oysters on November 10, 1997 at 39 µg/100g and <38 µg/100g, respectively. By November 13, 1997, the toxin level in the oysters reached 130 µg/100g, which triggered the same actions as those taken in Grays Harbor the day before. There were 27 companies affected by the bloom in Willapa Bay. The bloom peaked around November 20, 1997, when the highest toxin level (341 µg/100g), which was in Pacific oysters from the Bruceport Area, as recorded (Figure 5). All the commercial beds were reopened by December 17, 1997. The recreational closures for both coastal harbors were lifted on January 8, 1998. As in Grays Harbor, the rain storm in mid-November may have flushed the bloom out of Willapa Bay.

Outer Coast

During the time the blooms were occurring in the coastal harbors, a recreational razor clam (*Siliqua patula*) harvest was ongoing at Twin Harbors, the ocean beach between the mouth of Grays Harbor and Willapa Bay, in front of the town of Grayland. Consequently, the razor clams were being sampled and tested for PSP toxin. The razor clams never registered a detectable level of PSP toxin. This was a major departure from the historical record, which indicated that the razor clams normally became toxic before the shellfish inside the harbors registered toxin. The only location on the outside coast where PSP was detected was at Second Beach in Olympic National Park, which is just south of the Quillayute River. At that location, California mussels registered 832 µg/100g of toxin on November 15, 1997. This roughly coincides with the peak of the harbor blooms.

The PSP blooms of the late fall of 1997 were potentially disastrous. The cooperation between the shellfish industry and the staffs of the DOH Shellfish Program and the DOH Laboratory, which occurred in the face of a common threat, made it possible to protect public health and minimize the impact to the industry. Without that cooperation, the outcome could have been very different.

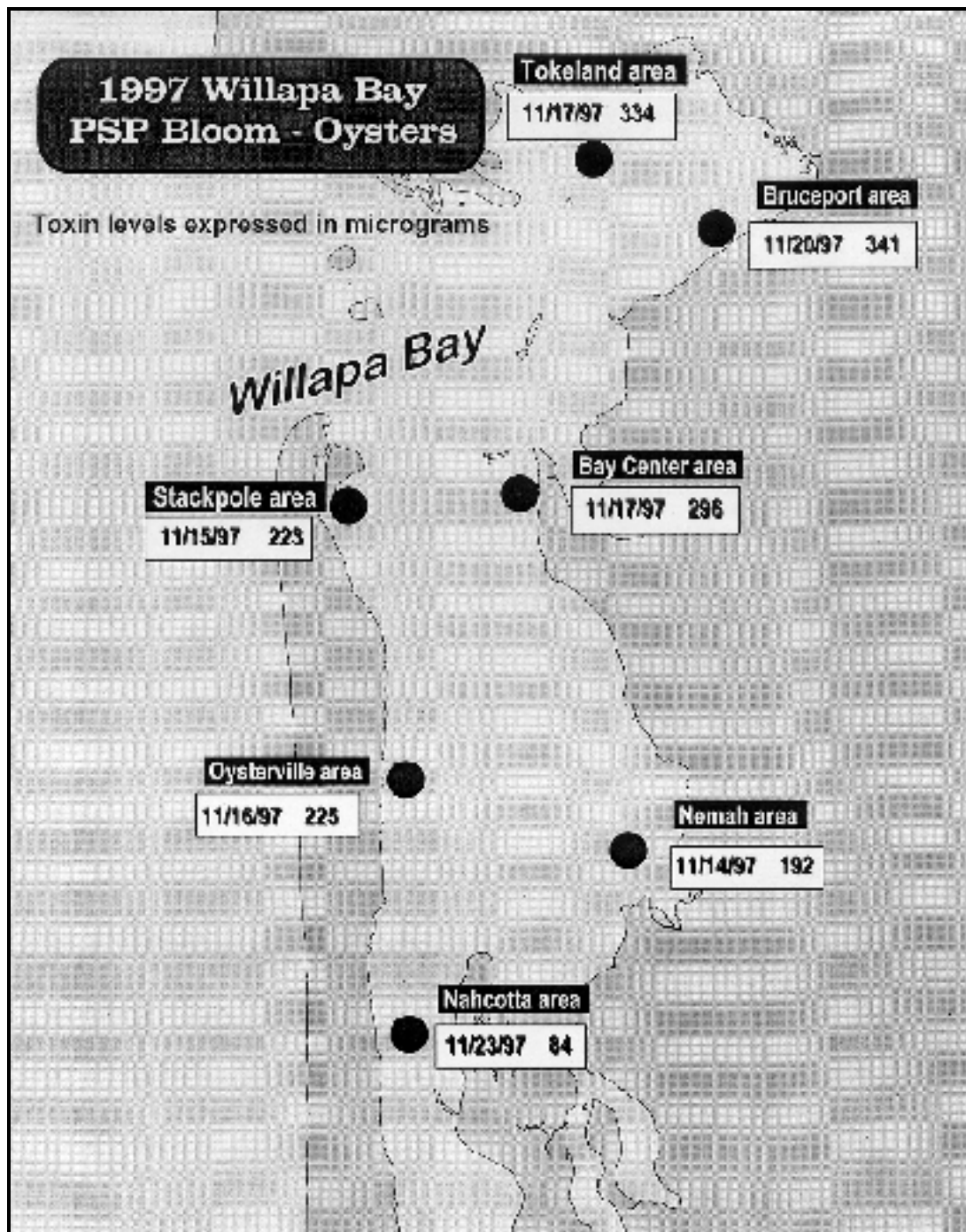


Figure 5. 1997 PSP in Willapa Bay.